



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/632,882	07/31/2003	Praburam Gopalraja	6775	3048

7590 08/30/2006

Patent Counsel
Applied Materials, Inc.
Post Office Box 450A
Santa Clara, CA 95052

EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 08/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/632,882

Applicant(s)

GOPALRAJA ET AL.

Examiner

Rodney G. McDonald

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 25-45 is/are allowed.
- 6) ☒ Claim(s) 1-8 and 13-24 is/are rejected.
- 7) ☒ Claim(s) 9-12 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>6-2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on June 7, 2006 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-8 and 13-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Ding et al. (U.S. PG PUB. 2005/0006222)

Regarding claim 1, Ding et al. teach a method of sputter deposition of material onto a substrate supported by a pedestal in a chamber. A magnetron is rotated about the back of the target the magnetron has an area of no more than $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity and surrounded by

Art Unit: 1753

an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole. Power is applied to thereby sputter material at a first rate. Power is applied to the pedestal to resputter deposition material on the substrate. Auxiliary magnets in the form of electromagnetic coils are disposed around the periphery of the pedestal. (See Claims 34, 35, 37, 59, 60)

Regarding claim 2, the target is spaced from the pedestal by a throw distance greater than 50% of a diameter of the substrate. (See Claim 34)

Regarding claim 3, the target is inhibited by sputtering by lowering the power to the target and resputtering of material occurs. (See Claim 37)

Regarding claim 4, the target is reduced. (See Claim 37)

Regarding claim 5, the power applied to the target is reduced to less than 3000 watts. (See Claim 38)

Regarding claim 6, the power applied to the target is reduced to less than 3000 watts. (See claim 38)

Regarding claim 7, since the power is reduced to the target it is inherent that the voltage to the target would reduce. (See claim 38)

Regarding claim 8, the voltage and power to the target can be reduced or set to 0 in order to resputter. (Page 14 paragraph 0130; Page 7 paragraph 0071)

Regarding claim 13, the pressure can be raised while resputtering in ICP mode. (Page 20 paragraph 0180, 0181)

Regarding claim 14, the RF power to be applied is in the range of 150-300 Watts when sputtering the target material in ICP mode. (Page 7 paragraph 0072)

Regarding claim 15, the pressure can be no more than 2mTorr during the sputtering process. (Claim 44)

Regarding claim 16, the pressure can be no more than 2mTorr during the process. (Claim 44)

Regarding claim 17, the pressure can be 2 mTorr. (Claim 44)

Regarding claim 18, the throw distance can be greater than 50% of a diameter of the substrate and the pressure no more than 2 mTorr. (Claim 34, 44)

Regarding claim 19, the throw distance can be greater than 80% of a diameter of the substrate. (Claim 62)

Regarding claim 20, the throw distance can be greater than 140% of a diameter of the substrate. (Claim 65)

Regarding claim 21, the deposition material can be tantalum nitride. (Claim 28)

Regarding claim 22, the deposition material can be tantalum. (Claim 8)

Regarding claim 23, the deposition material can be tantalum or tantalum nitride and the aspect ratio can be of at least 4:1. (Claim 1, 8)

Regarding claim 24, Ding et al. teach a method of depositing a layer of material into a plurality of holes. A chamber is provided having a target spaced from a pedestal for holding a substrate to be sputter coated by a throw distance greater than 50% of a diameter of the substrate. Rotating a magnetron about the back of the target, the magnetron having an area of no more than $\frac{1}{4}$ of the area of the target and including an

Art Unit: 1753

inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, the magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole. Applying at least a DC target power level of at least 3 KW while the chamber is pumped to a vacuum pressure to thereby sputter material from the target onto the substrate to maintain a self ionizing plasma to ionize at least a portion of the material sputtered from the target. The substrate is RF biased to attract sputtered material ions. The target power is reduced after depositing a layer of target material into the holes of the substrate. Argon gas is placed in the chamber. Applying a bias to the pedestal to resputter target material from the material from the bottom of the holes of the substrate. Generating a magnetic field to surround the pedestal to confine and increase the density of the plasma. (Claim 34, 35, 36, 37, 38, 44, 60; Page 7 paragraph 0071, 0072)

Claims 1-8 and 13-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Ding et al. (US PG PUB 2005/0255691).

Regarding claim 1, Ding et al. '691 teach a method of sputter depositing deposition material onto a substrate supported by a pedestal in a chamber. Rotating a magnetron about the back of the target the magnetron having an area of no more than $\frac{1}{4}$ of an area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole. Applying power to the target to thereby sputter material from the target onto the substrate at a first rate. Applying RF power to the pedestal to provide a plasma to

Art Unit: 1753

resputter deposition material on the substrate. Confining the plasma using a magnetic field generated by electromagnetic coils disposed around the periphery of the pedestal. (Page 11 paragraph 0112; Page 12 paragraph 0113, 0114, 0120 ; Page 16 paragraph 0148, 0149, 151)

Regarding claim 2, the throw distance can be greater than 50% of the wafer diameter. (Page 13 paragraph 0121)

Regarding claim 3, sputtering can be inhibited during resputtering. (Page 7 paragraph 0071)

Regarding claim 4, the power can be reduced during resputtering. (Page 7 paragraph 0071)

Regarding claim 5, the power applied to the target can be reduced to less than 1 kW. (Page 7 paragraph 0071)

Regarding claim 6, the power is reduced to 100-200 watts. (Page 7 paragraph 0071)

Regarding claim 7, the voltage is inherently reduced due to power reduction. (Page 7 paragraph 0071)

Regarding claim 8, the voltage is zero when the power is reduced to zero. (Page 7 paragraph 0071)

Regarding claim 13, the pressure can be raised while resputtering in ICP mode. (Page 20 paragraph 0180, 0181)

Regarding claim 14, the RF power to be applied is in the range of 150-300 Watts when sputtering the target material in ICP mode. (Page 7 paragraph 0072)

Art Unit: 1753

Regarding claim 15, the pressure during resputtering can be 0-2 mTorr. (Page 13 paragraph 0123, 0127)

Regarding claim 16, the pressure during resputtering can be 0-2 mTorr. (Page 13 paragraph 0123, 0127)

Regarding claim 17, the pressure has an internal pressure of 2 mTorr during resputtering. (Page 13 paragraph 0123, 0127)

Regarding claim 18, the target is placed from the pedestal by a throw distance of greater than 50% of a diameter and wherein the pressure is less than 5 millitorr. (Page 13 paragraph 0121, 0123, 0127)

Regarding claim 19, the target is placed from the pedestal a throw distance greater than 80% of the diameter of the substrate. (Page 13 paragraph 0121)

Regarding claim 20, the target is placed from the pedestal a throw distance greater than 140% of the diameter of the substrate. (Page 13 paragraph 0121)

Regarding claim 21, the deposition material can be tantalum nitride. (Page 13 paragraph 0120)

Regarding claim 22, the deposition material can be tantalum. (Page 13 paragraph 0120)

Regarding claim 23, filling an aspect ratio of at least 4:1 is discussed. (Page 1 paragraph 0009)

Regarding claim 24, Ding et al. '691 teach a method of sputter depositing deposition material onto a substrate supported by a pedestal in a chamber. Rotating a magnetron about the back of the target the magnetron having an area of no more than

Art Unit: 1753

¼ of an area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole.

Applying power to the target to thereby sputter material from the target onto the substrate at a first rate. Applying RF power to the pedestal to provide a plasma to resputter deposition material on the substrate. Confining the plasma using a magnetic field generated by electromagnetic coils disposed around the periphery of the pedestal. DC power can be at least 20 kW to 40 kW. (Page 3 paragraph 0018 ; Page 11 paragraph 0112; Page 12 paragraph 0113, 0114, 0120 ; Page 16 paragraph 0148, 0149, 151)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

Art Unit: 1753

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-8 and 13-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ding et al. (US PG PUB 2003/0116427) in view of Ding et al. (US PG PUB 2005/0006222).

Regarding claim 1, Ding et al. '427 a method of sputtering depositing deposition material onto a substrate supported by a pedestal in a chamber. Rotating a magnetron about the back of the target, the magnetron having an area of no more than $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole to generate a self-ionized plasma adjacent the target; applying power to the target to thereby sputter material from the target onto the substrate wherein at least a portion of the sputtered material is ionized in the self-ionized plasma. Biasing the substrate sufficiently to resputter deposition material from the substrate. (Page 15 claims 1, 33)

Regarding claim 2, the target is spaced from the pedestal a throw distance is greater than 50% of a diameter of the substrate. (Claim 21)

Regarding claims 3, 4, the target power is reduced to inhibit sputtering from the target. (Claim 33)

Regarding claim 5, the target power can be reduced less than 1kW. (Claim 10)

Regarding claim 6, the target is reduced to less than 200 watts. (Claim 11)

Art Unit: 1753

Regarding claim 7, the target can be reduced in voltage because the power is reduced to less than 200 watts. (Claim 11)

Regarding claim 8, the target can be reduced to less than 200 watts. (Claim 11)

Regarding claim 13, the chamber pressure can be raised during resputtering. (Claim 3, 77, 78)

Regarding claim 14, the RF power applied can be 150 watts. (Claim 91)

Regarding claims 15-18, the pressure can be less than 5 mTorr and the throw distance can be greater than 50% of a diameter of the substrate. (Claim 20, 21)

Regarding claim 19, the throw distance can be greater than 80% of the diameter of the substrate. (Claim 22)

Regarding claim 20, the throw distance can be greater than 140% of the diameter of the substrate. (Claim 23)

Regarding claim 21, 22, the material to be deposited can be tantalum or tantalum nitride. (See Abstract)

Regarding claim 23, aspect ratio of 4:1 can be filled. (Page 1 paragraph 0006)

Regarding claim 24, Ding et al. '427 a method of sputtering depositing deposition material onto a substrate supported by a pedestal in a chamber. Rotating a magnetron about the back of the target, the magnetron having an area of no more than $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole to generate a self-ionized plasma adjacent the target; applying power to the target to

Art Unit: 1753

thereby sputter material from the target onto the substrate wherein at least a portion of the sputtered material is ionized in the self-ionized plasma. Biasing the substrate sufficiently to resputter deposition material from the substrate. A DC power of at least 18 kW can be used for the target. (Page 15 claims 1, 33, 88)

The difference between Ding et al. '427 and the present claims is the use of an auxiliary magnetic field.

Ding et al. '691 teach utilizing an auxiliary magnetic field. (Page 13 paragraph 0121)

The motivation for utilizing an auxiliary magnetic field is that it allows for providing deeper hole covering. (Page 13 paragraph 0121)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Ding et al. '427 to have utilized an auxiliary magnetic field as taught by Ding et al. '691 because it allows for providing deeper hole coverage.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

Art Unit: 1753

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1-8 and 13-24 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over the claims of copending Application No. 10/495,506.

Regarding claim 1, Ding et al. teach a method of sputter deposition of material onto a substrate supported by a pedestal in a chamber. A magnetron is rotated about the back of the target the magnetron has an area of no more than $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity and surrounded by an outer magnetic pole of an opposite magnetic polarity, a magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole. Power is applied to thereby sputter material at a first rate. Power is applied to the pedestal to resputter deposition material on the substrate. Auxiliary magnets in the form of electromagnetic coils are disposed around the periphery of the pedestal. (See Claims 34, 35, 37, 59, 60)

Regarding claim 2, the target is spaced from the pedestal by a throw distance greater than 50% of a diameter of the substrate. (See Claim 34)

Regarding claim 3, the target is inhibited by sputtering by lowering the power to the target and resputtering of material occurs. (See Claim 37)

Regarding claim 4, the target is reduced. (See Claim 37)

Art Unit: 1753

Regarding claim 5, the power applied to the target is reduced to less than 3000 watts. (See Claim 38)

Regarding claim 6, the power applied to the target is reduced to less than 3000 watts. (See claim 38)

Regarding claim 7, since the power is reduced to the target it is inherent that the voltage to the target would reduce. (See claim 38)

Regarding claim 8, the voltage and power to the target can be reduced or set to 0 in order to resputter. (Page 14 paragraph 0130; Page 7 paragraph 0071)

Regarding claim 13, the pressure can be raised while resputtering in ICP mode. (Page 20 paragraph 0180, 0181)

Regarding claim 14, the RF power to be applied is in the range of 150-300 Watts when sputtering the target material in ICP mode. (Page 7 paragraph 0072)

Regarding claim 15, the pressure can be no more than 2mTorr during the sputtering process. (Claim 44)

Regarding claim 16, the pressure can be no more than 2mTorr during the process. (Claim 44)

Regarding claim 17, the pressure can be 2 mTorr. (Claim 44)

Regarding claim 18, the throw distance can be greater than 50% of a diameter of the substrate and the pressure no more than 2 mTorr. (Claim 34, 44)

Regarding claim 19, the throw distance can be greater than 80% of a diameter of the substrate. (Claim 62)

Art Unit: 1753

Regarding claim 20, the throw distance can be greater than 140% of a diameter of the substrate. (Claim 65)

Regarding claim 21, the deposition material can be tantalum nitride. (Claim 28)

Regarding claim 22, the deposition material can be tantalum. (Claim 8)

Regarding claim 23, the deposition material can be tantalum or tantalum nitride and the aspect ratio can be of at least 4:1. (Claim 1, 8)

Regarding claim 24, Ding et al. teach a method of depositing a layer of material into a plurality of holes. A chamber is provided having a target spaced from a pedestal for holding a substrate to be sputter coated by a throw distance greater than 50% of a diameter of the substrate. Rotating a magnetron about the back of the target, the magnetron having an area of no more than $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, the magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole. Applying at least a DC target power level of at least 3 KW while the chamber is pumped to a vacuum pressure to thereby sputter material from the target onto the substrate to maintain a self ionizing plasma to ionize at least a portion of the material sputtered from the target. The substrate is RF biased to attract sputtered material ions. The target power is reduced after depositing a layer of target material into the holes of the substrate. Argon gas is placed in the chamber. Applying a bias to the pedestal to resputter target material from the material from the bottom of the holes of the substrate. Generating a magnetic field to surround the

Art Unit: 1753

pedestal to confine and increase the density of the plasma. (Claim 34, 35, 36, 37, 38, 44, 60; Page 7 paragraph 0071, 0072)

Although the conflicting claims are not identical, they are not patentably distinct from each other because the claims of U.S. Application No. 10/495,506 teach the same method as required by Applicant's method claims except for the discussion of using DC or RF power for the substrate and the target. However, since the claims are broad enough to teach that any power sources can be used for producing the biases and powers and the DC and RF power sources are believed to be encompassed by the claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

Claims 9-12 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 25-45 are allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 9-12 are allowable over the prior art of record because the prior art of record does not teach the claimed method including comprising inhibiting sputtering of the target while resputtering the target material on the substrate wherein the inhibiting

Art Unit: 1753

includes reducing the power applied to the target to 100-200 watts and wherein the confining includes applying 5A of current to a first electromagnetic coil.

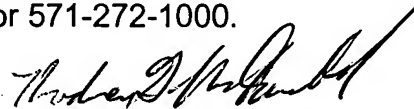
Claims 25-45 is allowable over the prior art of record because the prior art of record does not teach the claimed apparatus including a magnetron disposed adjacent the target and having an area of no more than about $\frac{1}{4}$ of the area of the target and including an inner magnetic pole of one magnetic polarity surrounded by an outer magnetic pole of an opposite magnetic polarity, the magnetic flux of the outer pole being at least 50% larger than the magnetic flux of the inner pole; an electromagnetic coil carried by the first shield and surrounding the shield; and a controller adapted to control the second power source to sputter the target in a first interval at a first power level and to reduce the power level to a second level in a second interval wherein target material is sputtered on the substrate primarily in the first interval, the controller being further adapted to control the first power source to provide RF power to the pedestal to bias a substrate on the pedestal and to capacitively couple RF power to maintain a plasma in the chamber in the second interval wherein target material deposited on the substrate in the first interval is resputtered from the substrate in the second interval, and the controller being further adapted to control the third power source to provide a magnetic field to surround the pedestal and confine the plasma to increase the density of the plasma in the second interval.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 571-272-1340. The examiner can normally be reached on M- Th with Every other Friday off.

Art Unit: 1753

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


Rodney G. McDonald
Primary Examiner
Art Unit 1753

RM
August 22, 2006